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SOLAR/1045-78/11

Monthly Performance Report

MONTECITO PINES

NOVEMBER 1978

U.S. Department of Energy

National Solar Heating and Cooling Demonstration Program

National Solar Data Program

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MONTHLY PERFORMANCE REPORT

MONTECITO PINES

NOVEMBER 1978

I. SYSTEM DESCRIPTION

The Montecito Pines site is an apartment complex in Santa Rosa, California. It consists of one instrumented unit containing eight apartments. Each apartment has approximately 864 square feet of conditioned space. Solar energy is used for space heating and preheating domestic hot water (DHW). The solar energy system which serves the 8-apartment unit has an array of flat-plate collectors with a gross area of 950 square feet. The array faces 22 degrees west of south at an angle of 45 degrees to the horizontal. Water is the transfer medium that delivers solar energy from the collector array to storage and to the space heating and hot water loads. Freeze protection is provided by drain down. Solar energy is stored underground in a 2000-gallon insulated tank. City water is circulated through a heat exchanger in the storage tank for preheating before entering a gas-fired boiler which supplies DHW on demand. When solar energy is insufficient to satisfy the space heating load, the gas-fired boiler provides auxiliary energy for space heating. The system, shown schematically in Figure 1, has four modes of solar operation.

Mode 1 - Collector-to-Storage: This mode activates when the collector plate temperature exceeds the storage temperature by 17°F and terminates when a temperature difference of 3°F is reached. Collector loop pump P1 is operating.

Mode 2 - Storage-to-Space Heating: This mode activates when there is a space heating demand and the temperature at the top of the storage tank is 105°F or higher. Space heating pump P2 is operating and mode diversion valves V1 and V2 divert the flow to the heat exchanger in the storage tank and bypass the gas-fired boiler.

Mode 3 - Auxiliary Space Heating, DHW Preheating: This mode activates when there is a space heating demand and the temperature at the top of the storage tank is less than 105°F. Space heating pump P2 is operating and mode diversion valves V1 and V2 direct the flow through the gas-fired boiler and bypass the heat exchanger in the storage tank.

Mode 4 - DHW Preheating: This mode activates when there is a demand for DHW. Incoming city water passes through the heat exchanger in the storage tank on the way to the gas-fired boiler which supplies hot water, on demand, to the apartments.

II. PERFORMANCE EVALUATION

INTRODUCTION

The solar energy system operated continuously during the month of November. Daily average solar radiation and ambient temperature were both below their

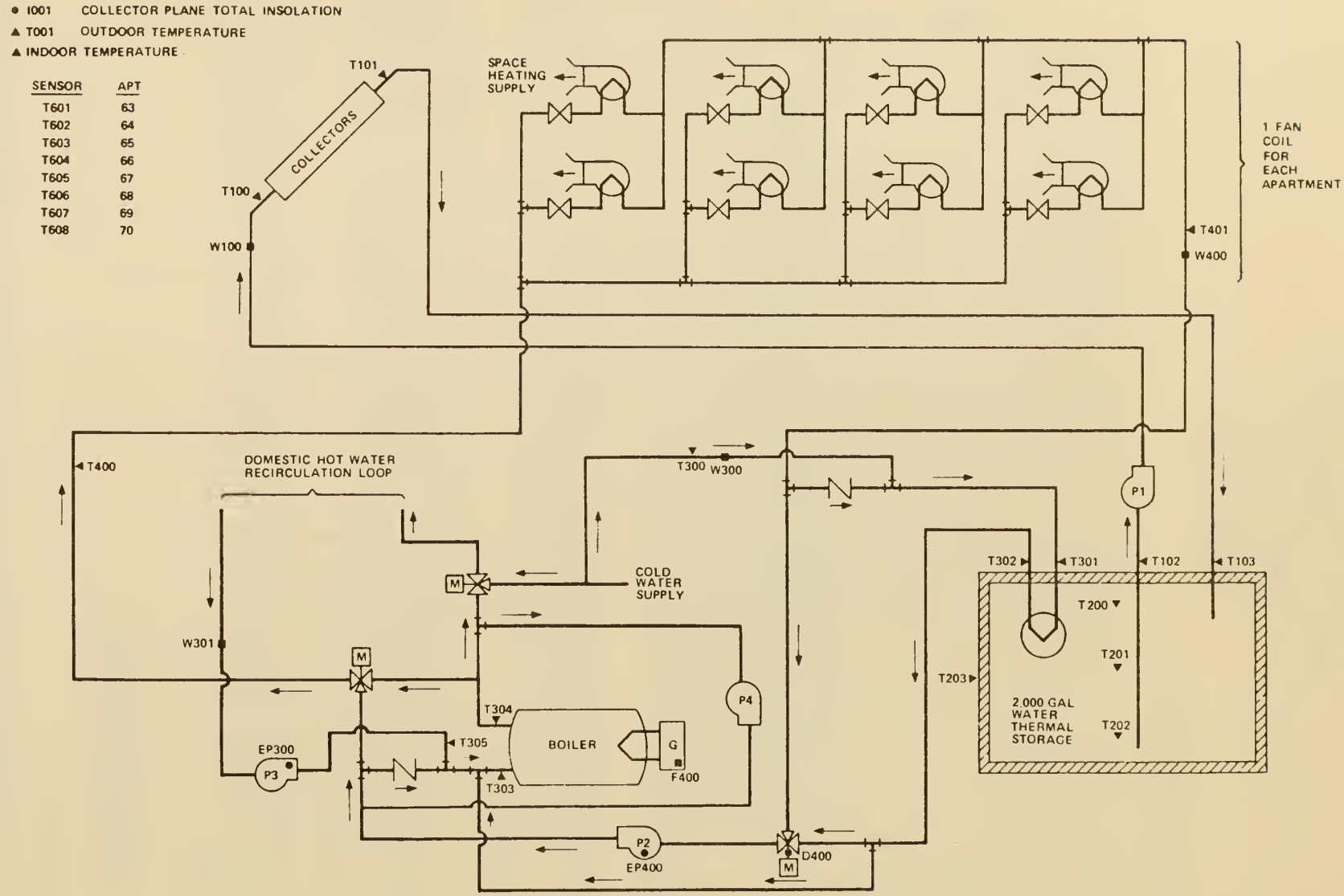

Figure 1. MONTECITO PINES APARTMENTS SOLAR ENERGY SYSTEM SCHEMATIC

long-term averages for November. Operational incident solar energy was 90 percent of total incident solar energy; approximately 30 percent of the incident solar energy was collected. Average storage temperature decreased slightly in November. The solar energy system satisfied a significant portion of the DHW and space heating loads in November.

WEATHER CONDITIONS

During the month, total incident solar energy on the collector array was 35.1 million Btu for a daily average of 1230 Btu per square foot. This was below the estimated average daily solar radiation for this geographical area during November of 1366 Btu per square foot for a plane facing 22 degrees west of south with a tilt of 45 degrees to the horizontal. The average ambient temperature during November was 48°F as compared with the long-term average for November of 54°F.

THERMAL PERFORMANCE

Collector - The total incident solar radiation on the collector array for the month of November was 35.1 million Btu. During the period the collector loop was operating, the total insolation amounted to 31.7 million Btu. The total collected solar energy for the month of November was 10.0 million Btu, resulting in a collector array efficiency of 29 percent, based on total incident insolation. Solar energy delivered from the collector array to storage was 8.3 million Btu. No solar energy was delivered from the collector array directly to the loads. Energy loss during transfer from the collector array to storage was 1.7 million Btu; this loss represented 17 percent of the energy collected. Operating energy required by the collector loop was 0.56 million Btu.

Storage - Solar energy delivered to storage was 8.3 million Btu. There were 7.1 million Btu delivered from storage to the DHW and space heating subsystems. Energy loss from storage was 1.2 million Btu; this loss represented 15 percent of the energy delivered to storage. The storage efficiency was 85 percent: This is calculated as the ratio of the sum of the energy removed from storage and the change in stored energy, to the energy delivered to storage. The average storage temperature for the month was 106°F.

DHW Load - The DHW subsystem consumed 1.7 million Btu of solar energy and 4.9 million Btu of auxiliary thermal energy (equivalent to 6.1 million Btu of auxiliary fossil fuel energy) to satisfy a hot water load of 5.3 million Btu. The solar fraction of this load was 31 percent. Losses from the DHW subsystem were 1.3 million Btu. The DHW subsystem consumed a total of 0.70 million Btu of operating energy. A daily average of 285 gallons of DHW was consumed at an average temperature of 143°F delivered from the tank.

Space Heating Load - The space heating subsystem consumed 3.3 million Btu of solar energy and 23.7 million Btu of auxiliary thermal energy (equivalent to 29.6 million Btu of auxiliary fossil fuel energy) to satisfy a space heating

load of 19.5 million Btu. The solar fraction of this load was 15 percent. Losses from the space heating subsystem were 7.5 million Btu. The space heating subsystem consumed a total of 2.2 million Btu of operating energy.

OBSERVATIONS

In this report a value of 1050 has been substituted for the previously used value of 1667 Btu per cubic foot of gas. The new value is a better estimate of the thermal content of the gas delivered to the apartments.

Sensor anomalies in the DHW recirculation loop occurred in November.

ENERGY SAVINGS

The solar energy system provided a total fossil fuel energy savings of 8.2 million Btu at an expense of 0.56 million Btu of electrical energy. The DHW subsystem provided a fossil fuel energy savings of 2.8 million Btu, while the space heating subsystem contributed a fossil fuel energy savings of 5.5 million Btu.

III. ACTION STATUS

IBM and Boeing will investigate and correct these anomalies during a January site visit.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
SITE SUMMARY

SITE: MONTECITO PINES SANTA ROSA, CA SOLAR/1045-78/11
REPORT PERIOD: NOVEMBER,1978

SITE/SYSTEM DESCRIPTION:
MONTECITO PINES IS AN APARTMENT COMPLEX WITH EIGHT INSTRUMENTED UNITS. THE SOLAR ENERGY SYSTEM PROVIDES SPACE HEATING AND DOMESTIC HOT WATER. THE COLLECTION STORAGE LOOP USES WATER FOR THE ENERGY TRANSFER AND STORAGE MEDIUM. WATER FOR DOMESTIC HOT WATER USE PASSES THROUGH A HX IN THE STORAGE TANK AND THEN THROUGH A GAS FIRED BOILER IN THE DHW RECIRC. LOOP. WATER FOR SPACE HEATING CIRCULATES THROUGH THE STORAGE TANK HX OR THROUGH THE GAS FIRED BOILER AND IS AVAILABLE TO INDIVIDUAL APARTMENTS ON DEMAND.

GENERAL SITE DATA:

INCIDENT SOLAR ENERGY	35.060	MILLION BTU
	26605	BTU/SQ.FT.
COLLECTED SOLAR ENERGY	10.040	MILLION BTU
	10569	BTU/SQ.FT.
AVERAGE AMBIENT TEMPERATURE	48	DEGREES F
AVERAGE BUILDING TEMPERATURE	69	DEGREES F
FCSS SOLAR CONVERSION EFFICIENCY	.14	
FCSS OPERATING ENERGY	0.564	MILLION BTU
TOTAL SYSTEM OPERATING ENERGY	3.484	MILLION BTU
TOTAL ENERGY CONSUMED	49.405	MILLION BTU

SUBSYSTEM SUMMARY:

	HOT WATER	HEATING	COOLING	SYSTEM TOTAL
LOAD	5.278	19.520	N.A.	24.782 MILLION BTU
SOLAR FRACTION	31	15	N.A.	19 PERCENT
SOLAR ENERGY USED	1.654	3.298	N.A.	4.907 MILLION BTU
OPERATING ENERGY	0.690	2.222	N.A.	3.484 MILLION BTU
AUX. THERMAL ENERGY	4.933	23.690	N.A.	28.620 MILLION BTU
AUX. ELECTRIC FUEL	N.A.	N.A.	N.A.	N.A. MILLION BTU
AUX. FOSSIL FUEL	6.166	29.624	N.A.	35.784 MILLION BTU
ELECTRICAL SAVINGS	0.000	0.000	N.A.	-0.564 MILLION BTU
FOSSIL SAVINGS	2.757	5.496	N.A.	8.178 MILLION BTU

SYSTEM PERFORMANCE FACTOR: 0.523

* DENOTES UNAVAILABLE DATA
@ DENOTES NULL DATA
N.A. DENOTES NOT APPLICABLE DATA

REFERENCE: USER'S GUIDE TO THE MONTHLY PERFORMANCE REPORT OF THE NATIONAL SOLAR DATA PROGRAM,FEBRUARY 28,1978, SOLAR/0004-78/18

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
SITE SUMMARY

SITE: MONTECITO PINES SANTA ROSA, CA SOLAR/1045-78/11
REPORT PERIOD: NOVEMBER,1978

SITE/SYSTEM DESCRIPTION:
MONTECITO PINES IS AN APARTMENT COMPLEX WITH EIGHT INSTRUMENTED UNITS. THE SOLAR ENERGY SYSTEM PROVIDES SPACE HEATING AND DOMESTIC HOT WATER. THE COLLECTION STORAGE LOOP USES WATER FOR THE ENERGY TRANSFER AND STORAGE MEDIUM. WATER FOR DOMESTIC HOT WATER USE PASSES THROUGH A HX IN THE STORAGE TANK AND THEN THROUGH A GAS FIRED BOILER IN THE DHW RECIRC. LOOP. WATER FOR SPACE HEATING CIRCULATES THROUGH THE STORAGE TANK HX OR THROUGH THE GAS FIRED BOILER AND IS AVAILABLE TO INDIVIDUAL APARTMENTS ON DEMAND.

GENERAL SITE DATA:

INCIDENT SOLAR ENERGY	36.988 GIGA JOULES
	410993 KJ/SQ.M.
COLLECTED SOLAR ENERGY	10.592 GIGA JOULES
	120012 KJ/SQ.M.
AVERAGE AMBIENT TEMPERATURE	9 DEGREES C
AVERAGE BUILDING TEMPERATURE	20 DEGREES C
ECSS SOLAR CONVERSION EFFICIENCY	0.14
ECSS OPERATING ENERGY	0.595 GIGA JOULES
TOTAL SYSTEM OPERATING ENERGY	3.676 GIGA JOULES
TOTAL ENERGY CONSUMED	52.122 GIGA JOULES

SUBSYSTEM SUMMARY:

	HOT WATER	HEATING	COOLING	SYSTEM TOTAL
LOAD	5.568	20.605	N.A.	26.145 GIGA JOULES
SOLAR FRACTION	31	15	N.A.	19 PERCENT
SOLAR ENERGY USED	1.745	3.479	N.A.	5.177 GIGA JOULES
OPERATING ENERGY	0.737	2.344	N.A.	3.476 GIGA JOULES
AUX. THERMAL ENG	5.204	25.003	N.A.	30.203 GIGA JOULES
AUX. ELECTRIC FUEL	N.A.	N.A.	N.A.	N.A. GIGA JOULES
AUX. FOSSIL FUEL	6.505	31.254	N.A.	37.754 GIGA JOULES
ELECTRICAL SAVINGS	0.000	0.000	N.A.	-0.595 GIGA JOULES
FOSSIL SAVINGS	2.909	5.799	N.A.	8.628 GIGA JOULES

SYSTEM PERFORMANCE FACTOR: 0.523

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REFERENCE: USER'S GUIDE TO THE MONTHLY PERFORMANCE REPORT OF THE NATIONAL SOLAR DATA PROGRAM,FEBRUARY 28,1978, SOLAR/0004-78/18

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
ENERGY COLLECTION AND STORAGE SUBSYSTEM (ECSS)

SITE: MONTECITO PINES SANTA ROSA, CA SOLAR/1045-78/11
REPORT PERIOD: NOVEMBER, 1978

DAY OF MONTH	INCIDENT SOLAR ENERGY MILLION BTU	AMBIENT TEMP DEG-F	ENERGY TO LOADS MILLION BTU	ANY THERMAL TO ECSS MILLION BTU	ECSS OPERATING ENERGY MILLION BTU	ECSS ENERGY REJECTED MILLION BTU	ECSS SOLAR CONVERSION EFFICIENCY
1	1.304	49	0.221	N	0.023	N	0.101
2	1.610	48	0.307	O	0.024	O	0.124
3	1.638	52	0.262	T	0.025	T	0.094
4	1.411	56	0.200		0.023		0.116
5	1.702	56	0.321	A	0.025	A	0.095
6	1.420	56	0.334	P	0.022	P	0.206
7	1.360	57	0.292	P	0.026	P	0.203
8	1.646	57	0.283	L	0.025	L	0.111
9	1.710	57	0.447	I	0.024	I	0.149
10	1.675	48	0.491	C	0.025	C	0.215
11	1.320	44	0.243	A	0.020	A	0.152
12	0.322	38	0.066	B	0.005	B	0.203
13	0.415	42	0.067	L	0.005	L	0.162
14	1.682	41	0.263	E	0.025	E	0.122
15	0.777	38	0.094		0.012		0.121
16	0.277	47	0.095		0.000		0.344
17	1.515	47	0.220		0.024		0.121
18	0.105	46	0.062		0.000		0.590
19	0.058	49	0.058		0.000		1.001
20	0.888	52	0.067		0.023		0.076
21	0.986	48	0.176		0.018		0.143
22	0.537	47	0.081		0.009		0.150
23	1.589	49	0.303		0.024		0.112
24	1.599	46	0.376		0.023		0.158
25	1.546	43	0.356		0.023		0.163
26	1.559	44	0.300		0.023		0.189
27	1.231	44	0.232		0.029		0.186
28	0.903	48	0.225		0.017		0.214
29	1.383	52	0.287		0.024		0.123
30	0.891	52	0.227		0.020		0.192
SUM	35.060	-	7.142	N.A.	0.564	N.A.	-
AVG	1.169	49	0.238	N.A.	0.019	N.A.	0.149
NBS ID	0001	N113			0102		N111

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
COLLECTOR ARRAY PERFORMANCE

SITE: MONTECITO PINES SANTA ROSA, CA SOLAR/1045-78/11
REPORT PERIOD: NOVEMBER,1978

DAY OF MONTH	INCIDENT SOLAR ENERGY MILLION BTU	OPERATIONAL INCIDENT ENERGY MILLION BTU	COLLECTED SOLAR ENERGY MILLION BTU	DAYTIME AMBIENT TEMP DEG F	COLLECTOR ARRAY EFFICIENCY
1	1.304	1.234	0.323	65	0.248
2	1.610	1.490	0.435	63	0.270
3	1.638	1.541	0.468	66	0.286
4	1.411	1.305	0.421	70	0.298
5	1.702	1.616	0.503	72	0.296
6	1.420	1.237	0.410	74	0.290
7	1.369	1.274	0.413	72	0.302
8	1.646	1.552	0.496	77	0.303
9	1.710	1.606	0.506	69	0.296
10	1.675	1.582	0.433	59	0.258
11	1.320	1.155	0.318	51	0.241
12	0.322	0.172	0.041	46	0.126
13	0.415	0.241	0.081	47	0.195
14	1.682	1.595	0.492	56	0.293
15	0.777	0.658	0.191	*	0.246
16	0.277	0.000	0.000	54	0.000
17	1.515	1.433	0.476	60	0.314
18	0.105	0.000	0.000	47	0.000
19	0.058	0.000	0.000	49	0.000
20	0.888	0.828	0.301	55	0.338
21	0.986	0.880	0.286	55	0.290
22	0.537	0.290	0.071	51	0.131
23	1.580	1.500	0.537	62	0.338
24	1.590	1.488	0.495	60	0.311
25	1.546	1.474	0.476	55	0.308
26	1.550	1.469	0.477	60	0.306
27	1.231	1.227	0.370	55	0.300
28	0.903	0.757	0.272	60	0.302
29	1.383	1.311	0.467	65	0.338
30	0.991	0.794	0.267	63	0.300
SUM	35.060	31.695	10.040	-	-
AVG	1.169	1.056	0.335	60	0.286
NBSID	0001		0100		N100

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
STORAGE PERFORMANCE

SITE: MONTECITO PINES — SANTA ROSA, CA SOLAR/1745-78/11
REPORT PERIOD: NOVEMBER, 1978

DAY OF MONTH	ENERGY TO STORAGE MILLION BTU	ENERGY FROM STORAGE MILLION BTU	CHANGE IN STORED ENERGY MILLION BTU	STORAGE AVERAGE TEMP DEG F	STORAGE EFFICIENCY
1	0.251	0.221	-0.000	107	0.880
2	0.374	0.307	-0.001	109	0.817
3	0.408	0.262	0.105	111	0.898
4	0.361	0.299	0.016	111	0.871
5	0.417	0.321	0.064	114	0.922
6	0.322	0.334	-0.031	115	0.939
7	0.325	0.292	-0.034	114	0.797
8	0.428	0.283	0.125	114	0.926
9	0.417	0.447	-0.071	116	0.801
10	0.362	0.481	-0.151	109	0.913
11	0.252	0.243	-0.007	105	0.937
12	0.026	0.066	-0.053	102	0.494
13	0.066	0.067	-0.020	100	0.715
14	0.423	0.263	0.077	104	0.853
15	0.153	0.004	-0.031	102	0.414
16	0.000	0.005	-0.008	99	1.000
17	0.308	0.220	0.116	102	0.865
18	0.000	0.062	-0.060	102	1.000
19	0.000	0.059	-0.061	98	1.000
20	0.226	0.067	0.114	99	0.851
21	0.235	0.176	0.003	104	0.749
22	0.040	0.081	-0.048	102	0.662
23	0.471	0.303	0.060	107	0.770
24	0.424	0.376	-0.003	109	0.877
25	0.413	0.356	-0.004	109	0.853
26	0.426	0.300	-0.030	108	0.846
27	0.300	0.232	0.025	105	0.857
28	0.220	0.225	-0.000	104	1.014
29	0.389	0.287	0.042	108	0.844
30	0.201	0.227	-0.044	105	0.913
SUM	8.337	7.142	-0.025	-	-
AVG	0.278	0.238	-0.001	106	0.854
NBS ID	0200	0201	0202		N178

* DENOTES UNAVAILABLE DATA.
∂ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
HOT WATER SUBSYSTEM

SITE: MONTECITO PINES — SANTA ROSA, CA — SOLAR/1045-78/11
REPORT PERIOD: NOVEMBER, 1978

DAY OF MON.	HOT WATER LOAD MILLION BTU	SOLAR FR. OF LOAD PER CENT	SOLAR ENERGY USED MILLION BTU	OPER ENERGY MILLION BTU	AUX THERMAL USED MILLION BTU	AUX ELECT FUEL MILLION BTU	AUX FOSSIL FUEL MILLION BTU	ELECT ENERGY SAVINGS MILLION BTU	FOSSIL ENERGY SAVINGS MILLION BTU	SUP. WAT. TEMP DEG F	HOT WAT. TEMP DEG F	HOT WATER USED GAL
1	0.180	24	0.044	0.023	0.225	N	0.281	0.000	0.073	71	150	274
2	0.214	17	0.037	0.023	0.223	O	0.278	0.000	0.062	68	151	316
3	0.216	17	0.036	0.024	0.210	T	0.262	0.000	0.061	70	153	325
4	0.145	16	0.023	0.024	0.223		0.279	0.000	0.038	70	156	214
5	0.099	13	0.013	0.025	0.187	A	0.234	0.000	0.022	70	157	148
6	0.207	8	0.016	0.025	0.256	D	0.319	0.000	0.026	70	157	286
7	0.177	4	0.007	0.024	0.176	D	0.220	0.000	0.012	70	156	243
8	0.137	25	0.034	0.024	0.183	L	0.229	0.000	0.057	71	155	202
9	0.176	3	0.005	0.025	0.164	I	0.204	0.000	0.009	68	158	240
10	0.215	17	0.036	0.024	0.196	C	0.245	0.000	0.060	67	157	307
11	0.164	23	0.038	0.023	0.146	A	0.183	0.000	0.064	69	155	238
12	0.140	44	0.066	0.022	0.117	B	0.147	0.000	0.109	67	151	239
13	0.163	41	0.067	0.022	0.145	L	0.181	0.000	0.112	68	146	255
14	0.102	30	0.059	0.023	0.178	E	0.222	0.000	0.098	66	150	289
15	0.183	51	0.094	0.022	0.098		0.122	0.000	0.157	65	137	322
16	0.193	49	0.095	0.022	0.142		0.177	0.000	0.159	66	132	357
17	0.201	44	0.089	0.023	0.185		0.231	0.000	0.149	66	133	362
18	0.119	52	0.062	0.022	0.065		0.081	0.000	0.103	65	131	220
19	0.119	49	0.058	0.022	0.076		0.095	0.000	0.097	66	131	221
20	0.142	47	0.067	0.022	0.132		0.165	0.000	0.112	68	134	258
21	0.218	44	0.095	0.023	0.205		0.257	0.000	0.159	65	135	390
22	0.149	54	0.081	0.022	0.105		0.131	0.000	0.134	64	131	270
23	0.155	19	0.030	0.024	0.152		0.190	0.000	0.050	65	128	259
24	0.179	26	0.046	0.024	0.121		0.152	0.000	0.076	65	125	304
25	0.193	24	0.047	0.024	0.137		0.171	0.000	0.078	64	134	332
26	0.219	35	0.077	0.024	0.227		0.284	0.000	0.128	63	135	366
27	0.177	47	0.083	0.024	0.194		0.242	0.000	0.138	62	130	283
28	0.179	52	0.093	0.023	0.140		0.186	0.000	0.155	64	134	330
29	0.176	33	0.059	0.024	0.155		0.194	0.000	0.098	64	135	306
30	0.239	40	0.096	0.023	0.162		0.203	0.000	0.160	64	135	412
SUM	5.278	-	1.654	0.690	4.933	N.A.	6.166	0.000	2.757	-	-	8558
AVG	0.176	31	0.055	0.023	0.164	N.A.	0.206	0.000	0.092	67	143	285
NRS	Q302	N300	Q300	Q303	Q301	Q305	Q306	Q311	Q313	N305	N307	N308

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
SPACE HEATING SUBSYSTEM

SITE: MONTECITO PINES — SANTA ROSA, CA — SOLAR/1045-78/11
REPORT PERIOD: NOVEMBER,1978

DAY OF MON.	SPACE HEATING LOAD MILLION BTU	SOLAR FR.OF LOAD PCT	SOLAR ENERGY USED MILLION BTU	OPER ENERGY MILLION BTU	AUX THERMAL USED MILLION BTU	AUX ELECT FUEL MILLION BTU	AUX FOSSIL FUEL MILLION BTU	ELECT ENERGY SAVINGS MILLION BTU	FOSSIL ENERGY SAVINGS MILLION BTU	BLDG TEMP DEG. F	AMB TEMP DEG. F
1	0.571	15	0.088	0.076	0.685		0.956	0.000	0.146	68	49
2	0.658	23	0.163	0.076	0.700		0.975	0.000	0.272	69	48
3	0.464	20	0.101	0.076	0.545		0.691	0.000	0.168	70	52
4	0.237	47	0.140	0.077	0.232		0.289	0.000	0.234	69	56
5	0.208	50	0.148	0.075	0.184		0.243	0.000	0.246	71	56
6	0.140	73	0.120	0.077	0.085		0.119	0.000	0.201	70	56
7	0.164	65	0.113	0.077	0.207		0.259	0.000	0.189	70	57
8	0.328	40	0.148	0.057	0.285		0.369	0.000	0.247	71	57
9	0.287	77	0.250	0.078	0.095		0.119	0.000	0.417	70	57
10	0.471	46	0.225	0.077	0.515		0.643	0.000	0.542	69	48
11	0.997	16	0.163	0.076	1.172		1.465	0.000	0.271	67	44
12	1.035	0	0.000	0.075	1.475		1.844	0.000	0.000	66	38
13	1.006	0	0.000	0.075	1.590		1.988	0.000	0.000	67	42
14	1.011	14	0.147	0.077	1.143		1.428	0.000	0.244	67	41
15	1.351	-0	0.054	0.076	1.775		2.218	0.000	0.090	67	38
16	0.820	0	0.000	0.076	1.173		1.466	0.000	0.000	69	47
17	0.681	13	0.094	0.076	0.834		1.043	0.000	0.156	69	47
18	0.923	0	0.000	0.076	1.331		1.664	0.000	0.000	68	46
19	0.851	0	0.000	0.076	1.276		1.595	0.000	0.000	69	40
20	0.429	0	0.000	0.076	0.690		0.863	0.000	0.000	69	52
21	0.500	12	0.045	0.080	0.670		0.838	0.000	0.076	68	48
22	0.820	0	0.000	0.080	1.148		1.435	0.000	0.000	67	47
23	0.570	24	0.147	0.081	0.610		0.763	0.000	0.245	69	49
24	0.818	24	0.206	0.082	0.808		1.010	0.000	0.343	68	46
25	0.974	20	0.205	0.083	1.060		1.326	0.000	0.341	67	43
26	0.725	29	0.218	0.073	0.690		0.863	0.000	0.363	68	44
27	0.404	23	0.147	0.025	0.527		0.658	0.000	0.244	64	44
28	0.709	12	0.092	0.070	0.882		1.103	0.000	0.153	69	48
29	0.451	24	0.111	0.071	0.537		0.671	0.000	0.185	70	52
30	0.526	12	0.075	0.071	0.737		0.921	0.000	0.125	70	52
SUM	19.530	-	3.298	2.222	23.699	N.A.	29.624	0.000	5.496	-	-
AVG	0.651	15	0.110	0.074	0.790	N.A.	0.987	0.000	0.183	68	48
NBS	0402	N400	0400	0403	0401		0410	0415	0417	N406	N113

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
ENVIRONMENTAL SUMMARY

SITE: MONTECITO PINES SANTA ROSA, CA SOLAR/1045-78/11
REPORT PERIOD: NOVEMBER,1978

DAY OF MONTH	TOTAL INSOLATION BTU/SQ.FT	DIFFUSE INSOLATION BTU/SQ.FT	AMBIENT TEMPERATURE DEG F	DAYTIME AMBIENT TEMP DEG F	RELATIVE HUMIDITY PERCENT	WIND DIRECTION DEGREES	WIND SPEED M.P.H.
1	1372	N	42	65	N	N	N
2	1605	O	48	63	O	O	O
3	1724	T	52	69	T	T	T
4	1496		56	70			
5	1792	A	56	72	A	A	A
6	1495	P	56	74	P	P	P
7	1441	P	57	72	P	P	P
8	1732	L	57	77	L	L	L
9	1800	I	57	69	I	I	I
10	1763	C	48	59	C	C	C
11	1390	A	44	51	A	A	A
12	330	B	38	46	B	B	B
13	437	L	42	47	L	L	L
14	1771	E	41	56	E	E	E
15	817		38	*			
16	292		47	54			
17	1595		47	60			
18	111		46	47			
19	61		40	40			
20	935		52	55			
21	1038		48	55			
22	566		47	51			
23	1672		40	62			
24	1672		46	69			
25	1627		43	55			
26	1641		44	60			
27	1296		44	55			
28	951		48	60			
29	1456		52	65			
30	938		52	63			
SUM	36905	N.A.	-	-	-	-	-
AVG	1230	N.A.	48	60	N.A.	N.A.	N.A.
NBS ID	0001		N113			N115	N114

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*U.S. GOVERNMENT PRINTING OFFICE: 1980-640-189/4137. Region 4.

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